



THE AMERICAN ASSOCIATION FOR
LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

**LOCKHEED MARTIN
DENVER METROLOGY SERVICES
Littleton, CO**

for technical competence in the field of **Calibration**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This laboratory also meets the requirements of ANSI/NCSL Z540-1-1994 and any additional program requirements in the field of calibration. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 18 June 2005*).

Presented this 20th day of December 2006.

A handwritten signature in black ink that reads "Peter Ohryer".

President
For the Accreditation Council
Certificate Number 2211.01
Valid to September 30, 2008



For the calibrations to which this accreditation applies, please refer to the laboratory's Calibration Scope of Accreditation.

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005
& ANSI/NCSL Z540-1-1994

LOCKHEED MARTIN DENVER METROLOGY SERVICES
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CALIBRATION

Valid To: September 30, 2008

Certificate Number: 2211.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following calibrations¹:

I. Electrical – DC/Low Frequency

Parameter/Equipment	Range	Best Uncertainty ² (\pm)	Comments
DC Voltage – Measure	(0 to 120) mV (0.1 to 1.2) V (1 to 12) V (10 to 120) V (100 to 1000) V	6.1 μ V/V + 3.5 μ V/V 5.7 μ V/V + 0.4 μ V/V 5.4 μ V/V + 0.1 μ V/V 9.0 μ V/V + 0.4 μ V/V 11 μ V/V + 0.1 μ V/V	Agilent 3458A/opt 002
DC Voltage – Generate	(0.00 to 220) mV > 220 mV to 2.2 V (> 2.2 to 11) V (> 11 to 22) V (> 22 to 220) V (> 220 to 1100) V	6 μ V/V + 0.4 μ V 3.5 μ V/V + 0.7 μ V 2.5 μ V/V + 2.5 μ V 2.5 μ V/V + 4 μ V 3.5 μ V/V + 40 μ V 4.5 μ V/V + 400 μ V	Fluke 5720A
DC Current – Measure	(0 to 120) μ A (0.1 to 1.2) mA (1 to 12) mA (10 to 120) mA (0.1 to 1) A	25 μ A/A + 9 μ A/A 21 μ A/A + 6 μ A/A 29 μ A/A + 6 μ A/A 40 μ A/A + 6 μ A/A 0.012 % + 12 μ A/A	Agilent 3458A/opt 002

Parameter/Equipment	Range	Best Uncertainty ² (\pm)	Comments
DC Current – Generate	(0 to 220) μ A (> 220) μ A to 2.2 mA (> 2.2 to 22) mA (> 22 to 220) mA > 220 mA to 2.2 A (> 2.2 to 11) A	35 μ A/A + 6 nA 30 μ A/A + 7 nA 30 μ A/A + 40 nA 40 μ A/A + 0.7 μ A 60 μ A/A + 12 μ A 0.034 % + 480 μ A	Fluke 5720A
DC Resistance – Measure	(0 to 12) Ω (10 to 120) Ω (0.1 to 1.2) k Ω (1 to 12) k Ω (10 to 120) k Ω (0.1 to 1.2) M Ω (1 to 12) M Ω (10 to 120) M Ω	17 μ Ω / Ω + 5.8 μ Ω / Ω 12 μ Ω / Ω + 5.8 μ Ω / Ω 9 μ Ω / Ω + 0.6 μ Ω / Ω 9 μ Ω / Ω + 0.6 μ Ω / Ω 9 μ Ω / Ω + 0.6 μ Ω / Ω 14 μ Ω / Ω + 2 μ Ω / Ω 59 μ Ω / Ω + 12 μ Ω / Ω 0.058 % + 12 μ Ω / Ω	Agilent 3458A/opt 002
Resistance – Generate, Fixed Points	0 Ω (1, 1.9) Ω (10, 19) Ω (100, 190) Ω (1, 1.9, 10, 19) k Ω (100, 190) k Ω 1 M Ω 1.9 M Ω 10 M Ω 19 M Ω 100 M Ω	40 parts in 10^6 80 parts in 10^6 21 parts in 10^6 9 parts in 10^6 7.5 parts in 10^6 9 parts in 10^6 15 parts in 10^6 16 parts in 10^6 31 parts in 10^6 39 parts in 10^6 95 parts in 10^6	Fluke 5720A

Parameter/Range	Frequency	Best Uncertainty ² (\pm)	Comments
AC Voltage – Measure			
(0 to 12) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz	0.072 % + 0.034 % 0.058 % + 0.013 % 0.058 % + 0.013 % 0.13 % + 0.013 % 0.58 % + 0.013 % 4.6 % + 0.023 %	Agilent 3458A/opt 002
(10 to 120) mV	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz	0.035 % + 0.005 % 0.015 % + 0.002 % 0.021 % + 0.002 %	

Parameter/Range	Frequency	Best Uncertainty ² (\pm)	Comments
AC Voltage – Measure (cont)			
(10 to 120) mV	(20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.038 % + 0.002 % 0.099 % + 0.002 % 0.35 % + 0.011 % 1.2 % + 0.001 %	Agilent 3458A/opt 002
(0.1 to 1.2) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.027 % + 0.034 % 0.009 % + 0.013 % 0.017 % + 0.013 % 0.035 % + 0.013 % 0.093 % + 0.013 % 0.35 % + 0.011 % 1.2 % + 0.011 %	
(1 to 12) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz 300 kHz to 1 MHz	0.027 % + 0.034 % 0.009 % + 0.013 % 0.017 % + 0.013 % 0.035 % + 0.013 % 0.093 % + 0.013 % 0.35 % + 0.011 % 1.2 % + 0.011 %	
(10 to 120) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.032 % + 0.005 % 0.023 % + 0.002 % 0.023 % + 0.002 % 0.041 % + 0.002 % 0.14 % + 0.002 %	
(100 to 1000) V	(1 to 40) Hz 40 Hz to 1 kHz (1 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.047 % + 0.005 % 0.047 % + 0.002 % 0.076 % + 0.002 % 0.16 % + 0.002 % 0.35 % + 0.002 %	
AC Voltage – Generate			
(2.2 to 22) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz	0.022 % + 4 μ V 85 μ V/V + 4 μ V 75 μ V/V + 4 μ V 0.018 % + 4 μ V 0.046 % + 4 μ V	Fluke 5720A

Parameter/Range	Frequency	Best Uncertainty ² (\pm)	Comments
AC Voltage – Generate (cont)			
(2.2 to 22) mV	(100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.09 % + 10 μ V 0.12 % + 25 μ V 0.25 % + 20 μ V	Fluke 5720A
(22 to 220) mV	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.022 % + 12 μ V 85 μ V/V + 7 μ V 75 μ V/V + 7 μ V 0.018 % + 7 μ V 0.042 % + 17 μ V 0.075 % + 20 μ V 0.12 % + 25 μ V 0.25 % + 45 μ V	
220 mV to 2.2 V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.022 % + 40 μ V 80 μ V/V + 15 μ V 40 μ V/V + 8 μ V 70 μ V/V + 10 μ V 0.011 % + 30 μ V 0.034 % + 80 μ V 0.09 % + 200 μ V 0.15 % + 300 μ V	
(2.2 to 22) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.022 % + 0.4 mV 80 μ V/V + 0.15 mV 40 μ V/V + 0.05 mV 70 μ V/V + 0.1 mV 95 μ V/V + 0.2 mV 0.026 % + 0.6 mV 0.09 % + 2 mV 0.13 % + 3.3 mV	
(22 to 220) V	(10 to 20) Hz (20 to 40) Hz 40 Hz to 20 kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz 500 kHz to 1 MHz	0.022 % + 4 mV 80 μ V/V + 1.5 mV 47 μ V/V + 0.6 mV 75 μ V/V + 1 mV 0.013 % + 2.5 mV 0.08 % + 16 mV 0.42 % + 40 mV 0.7 % + 80 mV	
(220 to 1100) V	(15 to 50) Hz 50 Hz to 1 kHz	0.026 % + 16 mV 60 μ V/V + 3.5 mV	

Parameter/Range	Frequency	Best Uncertainty ² (\pm)	Comments
AC Voltage – Generate (cont)			
1100 V 750 V 1 k Ω 1.9 k Ω	40 Hz to 1 kHz (1 to 20) kHz (20 to 30) kHz (30 to 50) kHz (50 to 100) kHz	80 μ V/V + 4 mV 0.013 % + 6 mV 0.036 % + 11 mV 0.036 % + 11 mV 0.13 % + 45 mV	Fluke 5725A
AC Current – Measure			
(0 to 120) μ A (0.1 to 1.2) mA (1 to 120) mA (0.1 to 1) A	(10 to 20) Hz (20 to 45) Hz 45 Hz to 1 kHz (10 to 20) Hz 20 Hz to 1 kHz (1 to 5) kHz (10 to 20) Hz (20 to 45) Hz (45 to 100) Hz 100 Hz to 5 kHz 10 Hz to 1 kHz (1 to 5) kHz	0.46 % + 0.04 % 0.17 % + 0.04 % 0.07 % + 0.04 % 0.46 % + 0.02 % 0.17 % + 0.02 % 0.045 % + 0.02 % 0.47 % + 0.02 % 0.17 % + 0.02 % 0.07 % + 0.02 % 0.04 % + 0.02 % 0.46 % + 0.02 % 0.12 % + 0.02 %	Agilent 3458A/opt 002
AC Current – Generate			
(22 to 220 μ A)	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.023 % + 16 nA 0.014 % + 10 nA 0.011 % + 8 nA 0.025 % + 12 nA 0.09 % + 65 nA	Fluke 5720A

Parameter/Range	Frequency	Best Uncertainty ² (±)	Comments
AC Current – Generate (cont)			
220 µA to 2.2 mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.023 % + 40 nA 0.014 % + 35 nA 0.011 % + 35 nA 0.018 % + 110 nA 0.09 % + 650 nA	Fluke 5720A
(2.2 to 22) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.023 % + 0.4 µA 0.014 % + 0.35 µA 0.011 % + 0.35 µA 0.018 % + 0.55 µA 0.09 % + 5 µA	
(22 to 220) mA	(10 to 20) Hz (20 to 40) Hz 40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.023 % + 4 µA 0.014 % + 3.5 µA 0.011 % + 2.5 µA 0.018 % + 3.5 µA 0.09 % + 10 µA	
(220 to 2.2) A	20 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.024 % + 35 µA 0.039 % + 80 µA 0.6 % + 160 µA	
(2.2 to 11) A	40 Hz to 1 kHz (1 to 5) kHz (5 to 10) kHz	0.04 % + 170 µA 0.085 % + 380 µA 0.33 % + 750 µA	Fluke 5725A

II. Time and Frequency

Parameter/Range	Frequency	Best Uncertainty ² (±)	Comments
Frequency – Generate, Fixed Points	(10) MHz	5.0 parts in 10 ¹²	Symmetricom 5071A with NIST GPS 76100S traceability service

¹ This laboratory offers commercial calibration service.

² “Best Uncertainty” is the smallest uncertainty of measurement that a laboratory can achieve within its scope of accreditation when performing more or less routine calibrations of nearly ideal measurement standards of nearly ideal measuring equipment. Best uncertainties represent expanded uncertainties expressed at approximately the 95 % level of confidence, usually using a coverage factor of $k = 2$. The best uncertainty of a specific calibration performed by the laboratory may be greater than the best uncertainty due to the behavior of the customer’s device and to influences from the circumstances of the specific calibration.